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REVIEW OF THE

TELEGRAPH AND TELEPHONE

A JOURNAL OF ELECTRICAL, SCIENTIFIC AND MECHANICAL NEWS.

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The Piano.

Oh, friend, whom glad or grave we seek,
Heaven-holding shrine!
I ope thee, touch thee, hear thee speak,
And peace is mine.
No fairy casket, full of bliss,
Outvalues thee;
Love only, wakened with a kiss,
More sweet may be.

To thee, when our full hearts o'erflow
In griefs or joys,
Unspeakable emotions owe
A fitting voice.
Mirth flies to thee, and love's unrest,
And Memory dear,
And Sorrow, with his tightened breast,
Comes for a tear.

Oh, since no joy of human mould
There waits us still,
Thrice bless'd be thine, thou gentle fold
Of peace at will.
No change, no sullenness, no cheat,
In thee we find;
Thy saddest voice is ever sweet,
Thine answer kind.

—*Leigh Hunt.*

Cost of Gas-Lighting in Principal Cities.

Leonard Henkle, of Rochester, who conceived the scheme of electric lighting from Niagara Falls, has published a tabular statement of the rank, population, number and cost of public lights, and yearly cost of domestic lights, for the sixty-five principal cities of the country. New Orleans, with a census population of 216,090, has 3 622 gas-lamps, which cost $63,943,20, and 1,574 kerosene lamps, costing $15,779.80—total $79,723 per year. Cleveland, population 160,146, has 3,729 gas-lamps, costing $71,084.06, and 1,265 kerosene lamps, costing $14,231.25—total, $85,315.31. Pittsburgh, population 156,389, has 1,345 gas-lamps, costing $22,865, and 2,200 kerosene lamps, costing $37,158—total, $60,033. Washington, D. C., population 147,293, has 4,250 gas-lamps, costing $106,250. Buffalo, census population 155,134, has 5,253 gas-lamps, costing $148,559 90. Electric lights have reduced the cost considerably.

Electric Lighting.

Quite a number of gentlemen attended an exhibition of the Edison Electric Company's system of incandescent lights at the Hotel Vendome, in Boston. The hotel has within the last ten days been provided with sixty of the lights, each having a power of sixteen candles, and the large dining-room, where fifty of the lights have been adjusted to the ordinary gas chandeliers, presented a most attractive appearance, the illumination being as strong and steady as could be desired. In addition to those in the dining hall, other lights in the form of drop burners, student lamps, and an elevator light (the first electric light ever used for an elevator) have been placed in the hotel, and many pleasant words are spoken of this new and decidedly modern innovation. Mr. William W. Munroe, the Boston agent of the company, under whose direction last night's exhibition was given, says the Edison Company now can fairly claim that it has passed its experimental age, and with its system perfect in all details, is now really achieving high practical results. The incandescent light, he adds, as used by the Pemberton, Arlington, Merrimac, and Worrumbo mills, and by numerous prominent business houses throughout New England, is daily proving that it is superior to gas in all ways, while at the same time more economical. Last night's exhibition was certainly a successful one, and the display made by this light gives promise of its widespread use at no distant day.—*Boston Herald.*

An Electric Railway Brake.

INTERESTING EXPERIMENTS MADE ON THE NEW YORK AND ROCKAWAY RAILROAD.

An exhibition was given of the newly patented Waldumer electro-magnetic brake at Rockaway Beach last Thursday. The system was applied to a train of four empty box-cars and a passenger coach on a track of the New York, Woodhaven and Rockaway R. R. The train made several trips at a speed of twenty-five miles per hour, and by an application of the brakes to the box-cars alone the train was stopped without perceptible jar in less than its own length. With the train running at the same rate, the rear car was detached and solely by the automatic action of the brake the isolated car was brought to a standstill within a distance of sixty feet. It is claimed that the device can be applied with equal facility to a train of forty cars. The results were considered entirely satisfactory by those present, among whom were Mr. W. W. Worthington, Superintendent of the Fort Wayne, Cincinnati and Louisville Railway, and Col. C. E. Garey, master car builder of the New York Central and Hudson River Railroad. The mechanism consists of a dynamo-electric generator stationed on the running board of the locomotive and operated by a rotary engine of one-horse power, which is only in motion when the brake is being set. The force of the current is regulated by the speed of the rotary engine. The brake is set by a throttle-valve the same as with the air-brake. Two copper wires run from the dynamo generator under the tender. There is a flexible terminal between the cars and the coupling which disconnects automatically when the train separates. The wires run to a magnet four inches in diameter and fifteen in length overlaid with insulated copper wires, which is practically a part of the axle and revolves with it. It is surrounded by an armature consisting of nine bars, which are engaged in the drum surrounding the whole. Its operation is such that when the current is turned into the wire of the magnet the bars are attracted and adhere to the magnet with a force proportionate to the strength of the current applied, causing the drum to revolve and wind up a chain communicating with the ordinary hand-brake device. By a system of leverage the initial power is increased eighty times at the point of application. The brake is released by simply stopping the rotary engine. The steam which works the rotary engine detracts nothing from the effective power of the locomotive, because it is used only when the steam is shut off from the locomotive. When attached to ordinary freight trains a "reserve generator" will be placed in the caboose which supplies the power that operates the brakes in cases of accidental uncoupling or breaking. The inventor claims that by this system freight trains can be brought to a halt by a uniform application of perfectly regulated force to each car of the train, thus placing them under as complete control as are passenger trains with the air brake. The inventor is Mr. A. L. Duwelius.

Familiar Talks About Electricity and Magnetism.

No. 2.

Let us remember that no matter how electricity manifests itself, no matter where it is manifested, or how developed, there is but one electricity, even though developed in two opposite states or conditions.

Referring once more to our prior statement that even at the present advanced epoch in the science of electricity, we cannot undertake to define its nature with any degree of positiveness; we may say with truth that the greatest experimentalist of the century, he who never asserted anything as a fact, until he had proved it by experiment—Faraday, himself—would never venture a positive answer to this most momentous question; nor would he ever place his ideas in such form as to be quoted, though we may, by carefully perusing his writings, judge pretty clearly for ourselves what his views were on the subject.

Electricity is one of those subjects upon which we talk learnedly, and think profoundly, feeling that we have nothing more to learn, when we are in our second decade of life, and our first of experience; when we

have just invented our first repeater, or an impracticable duplex, and which we gradually know less about from that time onward, until we realize that we do not know anything about it. We always find that those who have had the widest and most diversified experience in physical, experimental and practical electricity, are the most diffident in proclaiming their ideas thereon. For example, we find that the learned "Gordon" in his late work on Electricity and Magnetism, prefaces his work by the statement:

"We have as yet no conception of electricity, apart from the electrified body; we have no experience of its independent existence, and therefore we will commence our study of the science by considering the properties of electrified bodies."

During the latter part of the last century and the earlier part of the present century, two theories concerning the nature of electricity were prevalent, and one or the other was accepted by nearly every electrician of the time. The first originated in the discoveries of DuFay and Symmer.

DuFay was a French philosopher, and in 1733 and 1734 published memoirs regarding his researches. The discovery of the two opposite states of electricity is certainly due to him. Instead, however, of regarding these conditions as being merely different states of the same agency, his hypothesis was, that they were component parts of one force or fluid, that electricity was absolutely a peculiar substance or form of matter, that it was a highly attenuated fluid, pervading all bodies, and compounded of two primary elements, possessing distinct and opposite properties.

He called these supposed separate elements "vitreous" and "resinous" electricities. These names he bestowed, supposing that the same electrical condition was always produced upon bodies of the same character when rubbed; whereas we now know that much depends upon what they are rubbed with; that glass, for example, when rubbed with flannel becomes positively electrified, corresponding to DuFay's vitreous electricity; while when rubbed with the fur of a cat, it becomes negatively electrified, exhibiting what he called the "resinous" electricity.

He assumed these also to be highly elastic fluids, of perfect fluidity and elasticity, each repulsive of its own particles, but attractive of the particles of the other, so that when combined, they completely condensed or neutralized each other, the result being electrical repose or quiescence.

Whenever a disunion of these elemental fluids took place, each was supposed to become active, and produced electrical excitation, which consisted in the vanishing of one or the other fluid (according to the substance rubbed), and thus leaving the remaining fluid in excess and in possession of the field.

Such, briefly, was the theory of DuFay—which even to day lends a vivid coloring to the terms and imagery employed in speaking of electricity, its attributes and properties.

(TO BE CONTINUED.)

Edison's First District Completed.

A THOUSAND HOUSES TO BE SUPPLIED WITH THE ELECTRIC LIGHT BY SEPTEMBER.

The following circular was sent last week to every house-owner or tenant in the first district of the Edison Electric Light Company, that bounded by Spruce, Nassau, and Wall Streets and the East River:

"We are rapidly approching the completion of our central station from which you will be supplied with the Edison Light. Our street conductors are now laid, and it will be necessary in order to supply you with the light when we are ready, to connect your building with them. This will necessitate taking up a portion of the flagging in front of the building in order to run a small iron tube into the cellar. The work will take, under ordinary circumstances, two or three hours' time. We will bear the expense of making this connection, subject to the terms of our contract with you, which is, that if you ultimately decide to adopt our light permanently, you will pay the expense in making the connection, and the expense heretofore incurred in wiring your building; but if you decide not to adopt our light, no charge whatever is to be made against you, either for making the connection or for wiring."

With each circular is mailed a blank form to be filled up, authorizing the company to make the connection. This work is the last to be done by the company before lighting up down town. The station in Pearl Street, near Fulton Street, with its enormous dynamos and machinery weighing 180 tons, together with the boilers in the basement, is completely finished and ready to begin work at once. The mains are laid throughout the district, this work having occupied more than a year, and all the houses are "wired" ready for the lamps. The work of putting in the lamps is only a matter of a few days, or even of a few hours, if enough men are engaged in it. On Monday next Mr. Edison will begin a series of tests to determine many points of interest which cannot be studied when the system of mains is in use. These tests will be of interest to all persons and electricians engaged in the business of electric lighting. When they are completed the district will be lighted. Major Eaton, the Vice-President of the company, said this morning that this long expected event will take place not later than the first of September—perhaps two weeks earlier.

Mr. Edison has been working lately to get more light out of a horse-power than hitherto, and now gets twelve sixteen-candle lamps per horse-power of his steam engine. He has also perfected a device for stage effects, by which the light can be raised from the faintest glow to full power by degrees. Since June 1 he has filed fifty-one applications for patents upon electric-lighting devices, and has recently received twenty-eight patents, making one hundred and nine in all upon his system of electric lighting.

During July several isolated plants for lighting up busines buildings have been put in by the Edison Company up town. The Philadelphia *Ledger*, which has had the Edison lamp in use for the last few months, has doubled its plant, and the *Record*, of the same city, has ordered a plant. The Hotel Vendôme in Boston has also introduced this light.

Cheaper Telegraphy.

The cry for cheaper telegraphy is again making itself heard in the United States, and considering the specially high rates prevailing there the wonder is that it is not louder. The moderate tariff prevailing in Canada is satisfactory to our population, and no demand for change is heard. In England, however, where the Government has just realized 3 per cent. in its investment on a national telegraph system, a great clamor is arising for a radical reduction. It is true that this is the first occasion when such a profit has been able to be reported, but it quite suffices for the outcry. A large party at Parliament itself is on the war-path, and it has just been moved in the House of Commons that the rate for domestic telegraphing in the United Kingdom be reduced from one shilling to sixpence. On the occasion in question, Mr. Cameron showed that the earnings of the Postal Telegraph Department had gradually increased until they now amounted to £540,000. This sum was stated to be sufficient to pay 3 per cent. upon the capital employed and leave a surplus of £220,000. Mr. Pawcett, the Postmaster General, ably seconded the move in the direction of cheaper telegraphy, and asked only the permission of the Chancellor of the Exchequer to put the proposed rates in force. The British Postal Telegraph Department, it appears, believes that the number of domestic telegrams sent annually would only increase under the proposed half-rate from 25,000,000 in number to 30,000,000. On the other hand, those proposing the lower tariff claim that the number sent would be double those heretofore forwarded annually. This means that the present tariff is practically prohibitory, or the proposed change would fail to be self-sustaining. At present there are about 80,000 messages sent daily to points within the United Kingdom, and there are 5 000 offices to do the work. It is claimed that each office could do four or five times the work at present performed, with litt'e or no extra expenditure for additional apparatus and appliances. Of course it is highly desirable that in those countries were the entire telegraph system is in the hands of the Government the very lowest possible paying rates should prevail, and we believe that a very preceptible lowering of present rates is imminent in England. It is argued by the advocates for diminution that the wonderful inventions, within the last few years, in connection with telegraphy have reduced expenses while greatly augmenting capacity. For instance, among many others, Edison has invented a means by which two messages can be sent in the same direction over the same wire. Two messages can be sent simultaneously on the same wire in opposite directions, and by the duplux system the capacity is again doubled, furnishing the quadruple system, now in use on all the trunk lines in the States, and fast being introduced into Europe. And now still another new system is introduced, the inventor being a Mr. A. L. Parcelle, which surpasses in speed that of the American Rapid Telegraph Co., till now claiming to be unrivalled. The actual number of words sent, on an average, by the American Rapid Co. is from 600 to 700 per minute, while, with Parcelle's instrument 5,000 per minute are easily sent, it is asserted. Many other telegraphic inventions of scarcely less value might be cited. Their introduction, however, whether in the United Kingdom or the United States, has given rise to no pecuniary benefits in which the public has been allowed to share. The Government in the one and the monopolizing companies in the other have themselves grasped whatever good financial results have risen from their adoption. Thus the demand of the people that they should be allowed, by means of a reduction of the existing tariff rates, to share in these benefits, is but reasonable and equitable. That early success will crown this agitation in England may be calculated on, but we fear that with our neighbors the monopolistic grip is too tight to be easily relaxed, if at all. But, as said before, Canada, is so well satisfied with existing rates here that she will watch the struggle only as a disinterested spectator.—*The Shareholder.*

A Remarkable Trade-Mark Suit.

The decision just rendered by Judge Blatchford in the case of the Collins Company, argued before him in the United States Circuit Court, adds another chapter to the history of some interesting trade-mark legislation. The Collins Company is a Connecticut manufacturing concern, whose axes, edge tools, and agricultural implements are used in all parts of the world. They are stamped "Collins & Co.," the name adopted over fifty years ago by the original firm, of which the present company is the successor, and in use ever since.

The right to the exclusive use of this name upon the products of their manufactory has been steadily asserted by the Collins Company, and has been successfully maintained in the courts in numerous suits that have contributed no unimportant share to the development of trade-mark law. Among the earliest of these were twenty-three that were instituted against various English manufacturers. Subsequently nine American manufacturers were sued for branding their products with marks designed to pass for the Collins brand, without being precisely identical with

it, such as "H. Collins," "D. Collins," and "Collinas Bros. & Co." More recently, legal proceeding were instituted against a German manufacturer who was flooding the Cuban market with tools marked "Gobbins & Co." In all of these legal contests the Collins Company were successful. The frauds upon which they made war were punished by verdicts for pecuniary indemnification, and their further perpetration enjoined.

In 1879 the Collins Company learned that Oliver Ames & Son's Company, of North Easton, Mass., one of the oldest and largest shovel manufacturing concerns of the conntry, were making a shovel for foreign markets which they stamped "Collins & Co." and labelled sometimes in addition "Manufactured by Collins & Co.," and "manufactured and warranted by Collins & Co." The word "Ames" did not appear upon the implements in any shape. It was somewhat of a surprise to the Collins Company to learn of this infringement, since they were at the very same time buying shovel handles of the Ames Company for their own purposes. They notified the Ames Company to discontinue the use of their name, but were informed in return that the Ames Company had been using it for twenty-five years, and claimed that they had thereby acquired a species of property in it and a legal right to continue to stamp it on their shovels.

In the suit that was then brought, the Ames Company sought to make a point upon the fact that the product for which the Collins Company were mainly noted and which they sold most largely was their axes, while the mark "Collins & Co." was chiefly used by the Ames Company for shovels; and they claimed that the shovels thus branded and extensively sold during so long a period as a quarter of a century had built up a valuable reputation for them. If, therefore, the Collins Company objected to the use of their name upon the Ames shovels, they ought to have signified that fact long ago.

This claim was conclusively met by evidence showing that the Ames Company had carefully concealed their use of the Collins brand from the knowledge of the Collins Company, which remained in ignorance of the infringement, incredible as it may seem, for a period of twenty-three years. The Ames shovels were packed at the factory so that the mark could not be seen, and the packages were exported unopened. None were sold for use in the United States. It also appeared that, although over 600,000 of the shovels bearing the Collins mark had been sold by the Ames Company, they had never listed this implement in their catalogue.

The way in which the Ames Company first came to use the Collins mark was somewhat peculiar. In 1849 the tools of the Collins Company were much sought after by the miners of the Pacific coast, and when the gold seekers went to Australia, during the mining excitement of 1851 and the fol owing years, they took with them the high reputation of these implements. In 1856 an order for a supply of Collins shovels was forwarded to America, and was sent by the dealer who received it to the Ames Company. The Collins Company claimed that this order was meant for them; but the Ames Company filled it with their own manufactures, using the Collins mark. The shovels were shipped to Australia, and ever since then the Ames Company have had an extensive foreign trade in these implements.

Judge Blatchford has given judgment in favor of the Collins Company, granting a perpetual injunction, with an accounting for damages, which are said to amount to a very large sum. The fraud perpetrated so long and successfully is not likely to prove a paying investment in the end. At the same time it is a question whether the damages legally recoverable will compensate the Collins Company, even in a slight measure, for the injury indirectly inflicted upon their reputation by the sale of second-class implements, as those of the Ames Company are represented to be, under their name. Such injury cannot be calculated with sufficient definiteness to obtain adequate redress at law.—*Ex.*

On the Law according to which the Electromotive Force of a Magneto-electric Machine varies as a Function of the Resistance of the Exterior Circuit.

BY M. MARCEL DEPREZ.

The author, in his experiments on dynamo-electric machines, has been struck with the fact that the electromotive force developed in the ring of these machines not merely does not increase infinitely with tho intensity of the current which traverses the inducing electro-magnets, but even decreases very notably, whilst the current produced increases more and more.

He has thus been led to think that the electromotive force developed in the ring of a magneto-electro machine, whose magnetic field is constituted by a permanent magnet, is not constant, as has been hitherto admitted but is a function of the intensity of the current developed in the ring.

To verify this supposition, he has kept the magnetic field of a Gramme machine constant by exciting the inducers by means of an auxiliary source, and has examined how the electromotive force of the ring, turning at the same velocity, varies on closing the outer circuit with more and more feeble resistances. The experiments, given at length in the original memoir, show that the electromotive force developed on the ring decreases when the intensity of the current produced augments. They show also distinctly that the constant fall in the "characteristics," when the current produced becomes very intense, depends on the insufficiency of the inducers. These are, indeed, never too powerful, which is an additional argument in favor of large machines, as the author has demonstrated both theoretically and experimentally that a magnetic field of given intensity is the less expensive to obtain, as it is produced by electro-magnets of more considerable dimensions.

As for the cause of this phenomenon it may be explained as follows: suppose that the passage of the current is suppressed in the inducers and only let pass in the ring, the latter becomes a powerful magnet, the polar lines of which coincide with the diameter, which passes through the points of contact of the brushes and the collector.

If we invert the operation by suppressing the current which traverses the ring, and re-establishing that in the inducers, the polar line coincides with that of the inducers. Hence it results that when the current traverses at once the ring and the inducers, the line of the poles of the ring occupies a position intermediate between the two extreme positions just defined, and may even be determined by that of a construction analogous to that of the parallelogram of forces. It is easy to see, on applying this construction, that the polar line of the ring approaches so much the more to the line of contact of the brushes as the current traversing the ring is more intense, whilst the maximum difference of the potential between the two brushes corresponds, on the contrary, to the case where the polar line of the ring is perpendicular to the diameter, passing through the points of contact.

This amounts to saying that, in proportion as the intensity of the current traversing the magnetic ring increases, the wires of the ring intersect the lines of force of the magnetic field, comprised between the polar pieces and the ring at an angle which differs more and more from a right angle, which is, as is known, the angle corresponding to the maximum electromotive force.

The sole means of reducing within certain limits the defect inherent in all dynamo-electric machines consists in the use—

1st. Of very powerful inducers, surrounded with a moderate quantity of wire.

2nd. Of brushes of variable level.

Remarks on the Use of Zinc-coke Elements in Electrolysis.

BY R. BERTHELOT.

A zinc coke element cannot be regarded as equivalent to a zinc-platinum element in calculating the quantities of heat set free by the reactions which give rise to the galvanic current. The heat disengaged by the attack of the zinc and the acid is not, in the case of coke, the only heat. The coke exerts in these conditions peculiar and complicated reactions. It absorbs hydrogen and oxygen, and intervenes both by the pure carbon which it contains and by the foreign matters mixed in its mass. This is shown by the researches of M. E. Becquerel ("Annales de Chimie et de Physique," 3d Série, t. xlviii., p. 256) on the electromotor of such elements. The author adds that the thermic values which express electrolytic reactions are only established for dilute liquids; the effects due to the separation of a trace of acid and of base in saturated saline solutions cannot be exactly calculated by reason of the changes of concentration and the secondary reactions. The principles of the calculation are the same, but the data are wanting.

Oscillations of the Plane of Polarization by the Discharge of a Leyden Battery—Simultaneity of the Electrical and Optical Phenomena.

BY MM. E. BICHAT AND R. BLONDLOT.

We have undertaken to study the rotation of the plane of polarization in a transparent body under the action of the current of the discharge of a Leyden jar. The experiment was arranged in the following manner: between a polarizer and an extinction analyzer was placed the transparent body in a coil of long and thin wire, connected with the coatings of a battery. In the circuit was introduced a universal discharger, which permitted the discharge to be produced when the difference of potential is sufficient. At the moment of each discharge the eye placed before the analyzer perceives a bright reappearance of light, which shows that the plane of polarization has deviated.

MM. Bichat and Blondlot, in a recent note to the French Academy of Sciences on the oscillations of the plane of polarization of light by the discharge of a battery, have demonstrated that the electrical and optical effects are simultaneous. In studying the rotation of the plain of polarization under the discharge from a Leyden jar they took a polarizer and extinction analyzer, and placed between them a coil of long fine wire having the transparent body inside it. The ends of the wire were connected to the armatures of a Leyden jar and an exciter was intercalated in the circuit which permitted the discharge to take place when the differential of potentials reached a certain pitch. At the moment of discharge the eye perceived a flash of light which showed that the plane of polarization had been deviated. By a modification of this apparatus they have proved that the plane of polarization is actually *oscillated* round its normal position by the discharge which is itself oscillatory, and that the two oscillatory effects keep time with one another. In fact the oscillations of the plane of polarization are either simultaneous with the oscillations of the discharge or follow it in an inappreciable time after. The retardation, if any exist, is estimated by the authors at less than $\frac{1}{50000}$ of a second.

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In connection with the article from our Paris correspondent in last issue, giving the statistics, &c., of the telephone business in Europe, we should have stated that the communication was prepared by Robert G. Brown, Esq., formerly of this city, a gentleman well known in telephone circles, and not Major Brown, who is at present in this country.

A series of interesting telephonic experiments were made, on the 4th of July, between Nancy and Paris The resistance of the line was about 6,000 ohms, and the distance 353 kilometers. Two sets of 3 leclanchés were used on the microphone. The de Kabath accummulator was tried, but was not found superior to the leclanchés. Although successful, the experiments have shown that it is not practical to correspond at so great a distance with the ordinary microphone. An induction coil of 300 ohms gave better results than one of 150 ohms, but an increase of the resistance in the coil is not a very great improvement. The experiments will be continued with other dispositions in the instruments. A new relay invented by M. Ader was tried also and it was found to work well with two cups of battery. The invention consists principally in a bobbin of 10 ohms resistance hung as a pendulum between the four poles of two G magnets placed parallelly. The motion of the pendulum either way serves to close a local circuit.

Referring to M. Van Rysselberghe's new system of telephone once more, we reproduce communication from Mr. F. Geraldy to the *La Lumiere Electrique* concerning it, with our comments:

"The system had first been put in operation on the line from Brussels to Ostend, but its inventor, desiring to experiment with it to a greater distance, has just tried it between Paris and Brussels. . . .

Through the kindness of Mr. Van Rysselberghe I was permitted to be present at the experiments on the 17th of May. I ascertained that conversation between Paris and Brussels was easy, that articulation was clear, and that it was not necessary to speak loud, but only in a clear and distinct voice—that, however, being required by the telephone.

Such a result, were it the only one obtained, would doubtless not be absolutely new, for our readers will recall the experiments at great distances with the Herz system, that we have had occasion to describe. Various attempts of this nature have been made with more or less success, but we may say that that of Mr. Van Rysselberghe has succeeded better than any that has been tried. But this is only one feature of the system.

The inventor has bestowed his attention on a means of overcoming that terrible enemy of the telephone, induction. On this subject, I recall anew the studies made by Mr. Herz, on a means of employing the condenser in telephone lines as a preserver as well as a receiver. The process employed by Mr. Van Rysselberghe has some points of contact with those experiments, while very sensibly differing from them. Mr. Van Rysselberghe, by an ingenious detour, instead of guarding against induction on the telephone line where it produces its injurious action, endeavors to prevent its occurrence by suppressing it in the lines on which it is produced. To this point we shall hereafter return more in detail. He has experimented, however, only imperfectly at Paris, where there was no time during these first experiments, designed only as a study, to provide all the prejudicial lines with preservative apparatus. The partial experiments have, however, sufficed to prove the efficacy of the process on telegraph lines.

From the combination of these two measures (I mean the improved telephone, and induction overcome), Mr. Van Rysselberghe has derived an unexpected and striking result; for he has succeeded in putting upon the same line, and in causing to operate at the same time, a Morse telegraphic apparatus and a telephone. I have seen these apparatus work at the same time, and it is beyond dispute that they do not perceptibly interfere with one another, the double transmission being effected without any difficulty. At the first trial, which took place on the 16th, there were transmitted simultaneously to Brussels two dispatches. The telephone dictated one (which it is unnecessary to reproduce here), while the telegraph was registering another (and entirely different one). These two dispatches were at once sent to their address. It should be remarked that they passed at ten minutes past eight in the morning, that is to say, after the work of the office had been resumed, and when inductive actions were already very energetic. We shall study more at leisure the processes employed by Mr. Van Rysselberghe, but it has seemed to us well to call attention to these beautiful experiments at once after their occurrence."

Mr. Van Rysselberghe is sub-director of the Brussells Observatory, and has bestowed much attention to the problem of long-line telephony; and it is recorded that in experiments made between Paris and Brussells, considerable success was achieved by him. In the present state of telephonic science, this achievement, did it stand alone, would be scarcely worth a second thought, since the readers of the *Review* well know that longer distances than that between Paris and Brussells are spanned by the telephonic wire in our own country, and that daily communication is effected over lines varying from half a mile to a hundred miles.

But Mr. Van Rysselberghe found, as we all do, that when his line ran parallel to other wires used for telegraphic purposes, his telephonic signals were overpowered by other signals induced by the parallel wires, and naturally was much annoyed by the discovery.

He does not appear to have met with any trouble arising from earth or atmospheric electricity, which is one of the worst enemies to the telephone when used upon long lines in the United States.

Now, a great many remedies have, from time to time, been proposed for the inductive disturbances originating in foreign and parallel conducting wires; but the remedy of Van Rysselberghe differs materially from all of them in one respect, *i. e.:*

So far as we know, all plans heretofore proposed have been applied to the disturbed wire, except in cases where both wires were used for telephonic transmission. Such, for example, is the idea of Rosebrugh and Black, who proposed to place the operating telephones on one side of a condenser interposed between the line and ground, or the metallic circuit idea of causing an induced current to attack both direct and return circuit, and so neutralize itself by its own activity, as it were; or, surrounding the different wires in a cable, with a conducting surface over their insulation, connecting that surrounding conductor with the earth.

Van Rysselberghe adopts another plan; he endeavors to obviate the inductive disturbances at their originating point, and to this end he arranges in the telegraphic circuit a series of adjustable resistances, so arranged that when the key is pressed, resistances varying from infinity to nothing, are introduced into the line. The theory is that by charging the line thus gradually and slowly the inductive effects generated are much less intense and are no longer sufficiently powerful to affect adversely the telephonic communications.

A second method is also adopted. In addition to terminating the telegraph line through the key to ground, a branch is also led from the line before it arrives at the key to one side of the condenser; the other side being connected with the ground.

It is said, that when the resistance and condenser plans are combined, a complete elimination is effected.

A third result of Mr. Van Rysselberghe's experi-

ments is stated to be the discovery of a practical method of simultaneously transmitting on the same wire a Morse and a telephonic message.

The details of this are not as yet made public We must, however, not forget that Elisha Gray has patented in this country a method of accomplishing the same feat; the said method consisting in bridging the Morse keys by high resistances, and the resistances by condensers.

We shall impatiently look for the details of Van Rysselberghe's plan, which, though it may not be entirely a commercial success, will at least be a scientific achievement of no small extent. If it comes near the invention of Gray, it will prove at least that Gray's invention is practicable, and if it prove to be entirely new, so much the better. We cannot know too much concerning this subject.

Referring once more to the plan described of obviating inductive disturbances, it may be hoped that it is as efficacious as is stated

We are aware that inventors and discoverers in this branch of science are frequently deceived regarding the merit of their own inventions, and sometimes an experiment when repeated, in the uncertain realm of telephony gives results diametrically opposite to those obtained on the first trial.

We cannot, however, refrain from pointing out that to arrange the circuits as described, it becomes necessary that the telephone operating corporation must own also, or at all events, exercise considerable influence over the affairs of the telegraphic source of the inducing currents: for what telegraph company would care to have the enterprising experimenters of a telephone company re-organize their circuit arrangements even in such a laudable cause. Will some American Van Rysselberghe not step to the front, and tell us how to muzzle the atmospheric disturbances which trouble our lines much more than now Morse induction can do ?

M. d'Arsouval, of Paris, has imagined a new form of telephonic receiver. The magnet is circular, similar to an Ader, but only one bobbin is used. It is placed on an armature, presenting itself in the center of the diaphragm. The novelty consists in surrounding the bobbin by the armature of the free end of the magnet. It is well constructed, entirely metallic, save the parillon, which is of ebonite. The voice is very clear and loud. It cannot get out of adjustment.

During a recent thunder storm at Carrollton, Ill , the lightning struck the house of Mr. D. H. Gillespie, a resident of that city. The course of the electricity was as follows: Striking the lightning rod, on the top of the main part of the house, this conductor was followed until a point was reached about the middle of the peak; here it is stated was a bad connection to which opposed the further passage of the electricity. It therefore here branched off down a tin gutter until arriving at the edge of the roof, all conducting material ceased. The electricity then made its way across the wall, tearing off the weather boards *en route*, until another conductor was reached, this time a good one—a telephone wire connected with good earth; after reaching this wire the current passed harmlessly away into the earth.

We may here note, that the house referred to, was protected first, by a lightning-rod, and second, by a telephone line. It appears also that the lightning rod, as usual, was not a well constructed one; while the telephone line (we are afraid *not* as usual), was well constructed, and wonderful to relate, had a good and serviceable ground termination.

So long as irresponsible parties are suffered to carry on the lightning rod business, so long must trouble and disaster be expected to ensue.

In the present case, the damage is ascribed to the defective connection at the middle of the roof. Partly, no doubt, such was the case; other elements, we think, had their share in the matter.

In the absence of a detailed description, we may assume that the lightning conductor had an imperfect ground connection, was fastened to the house with insulators, and probably did not extend to a sufficient height above the roof to be an efficient protection.

Also from the fact that the electricity left the conductor at a point on the ridge, it would appear that the said conductor extended for some distance horizontally; a position which for lightning-rods is to be deprecated.

A lightning conductor fulfils two functions: it facilitates the discharge of the electricity to the earth, so as to carry it off harmlessly; and it tends to prevent disruptive discharge by silently neutralizing the conditions which determine such discharge in the neighborhood of the conductor.

To effect these objects, the rod should extend to a sufficient height, to be the most salient feature of the building, no matter from which direction the storm may come. The size of the rod, if copper, should not be less than $\frac{3}{8}$ of an inch, or of iron, not less on any consideration than $\frac{9}{16}$ of an inch. (We are aware that such a size will be considered preposterous by lightning-rod manufacturers), but such a size is the minimum of absolute safety. The connection with the earth should be electrically perfect, should be branched in all possible directions, and if possible should be both soldered to gas or water mains, and to a plate sunk in moist earth. All joints should be soldered; and in no case should any portion of the rod run horizontally for more than four feet, unless ground connections are provided; where corners are to be turned they ought always to be turned with a gentle curve, and finally, lightning-rods should never be insulated from the building. Is it conceivable that a stream of electricity can jump from a cloud to earth, and can then be kept on an iron rod by half an inch of glass? We may rest satisfied that if a rod is otherwise properly constructed, atmospheric electricity will never leave a good metallic conductor for a poor wooden one.

Having noted these points, telephone men can appropriate to themselves a few lessons from them: First, that it is not safe to rely upon a lightning conductor for a ground. Second, always to be particular in constructing such a good ground wire, that a telephone ground wire shall be a synonym for a good one, as a lightning-rod ground is a bad one. Third, to have our ground wire large enough for the escape of heavy currents; this refers especially to the lightning arrester ground. Fourth, to run our ground wire to as many different points of communication with the earth as possible. Fifth, let your lightning arresters always be in good order, and your ground wires attached thereto, as straight as convenient. Finally, let us be particular in soldering joints, but if we never solder any other, let us never fail to solder the earth connection.

A telephone line is always a protection, but much more so, when properly installed, than when carelessly constructed.

The New Cable Company.

LONDON, July 22.—The prospectus has been issued of the European, American, Canadian, and Asiatic Cable Company. The capital is £1,500,000. The company proposes to work at a nine-pence-per-word rate. The prospectus provides for the establishment of necessary land and water communications for connecting points in Canada with New York City on the one side, and for laying the company's cable from Canada to Europe on the other.

The old messengers at the Stock Exchange have been replaced by American District Telegraph Co.'s messengers.

Measures of Electricity.

Many young men, although very practical and expert in ordinary telegraphic and telephonic combinations, do not possess any theoretical instruction outside of the knowledge of mere technical words, which they can apply correctly, but of which they cannot give a definition. I will undertake to explain briefly the unities of measure most frequently used in electricity.

The strength of a battery can be divided into two parts; one part representing the quantity (or intensity) of electricity which it furnishes, and the other the penetration, tension or electro-motive force of the current. The quantity is subordinate to the size and the tension to the chemical affinity of the substances of the battery. (In dynamos thick wires produce quantity, and fine, long wires tension.) Therefore the tension is the same in a small battery as in one a hundred times larger, providing the same chemicals are used in both, but the quantity produced by the latter will be one hundred times greater. Several small batteries can take the place of a large one by connecting together all the poles of the same name. In this case the intensity of the total battery will be equal to the sum of each. If, on the contrary, the positive pole of one cell be connected to the negative pole of another, the tension is doubled but the quantity remains the same.

The interior resistance of a battery is equal to that of the exterior conductor which gives to the battery its maximum of effects. Therefore, to put up a set of batteries in the most economical way, the resistance of its inside circuit must be equal to the resistance of the outside one.

Resistance is generally calculated in *ohms*, sometimes in *unities of Siemens* and in the *French unity*.

An ohm is the resistance which a column of mercury 1.0486 of a meter in length, a millimeter in section at the temperature of zero centigrade (32° Fahr.), opposes to the passage of a current. This represents about 500 feet (501.5) of No. 15 copper wire Birmingham gauge, or 100 feet (99.1) of No. 21 wire, same gauge.

The unity of Siemens is very nearly equal to the ohm, and the French unity is equal to the resistance of one kilometer of iron wire four millimeters in diameter.

Here are the relations between them:

1 ohm is equal to 1.0486 unity Siemens.
10 ohms " " about 1 French unity.
1 unity of Siemens " 0.9536 of an ohm.

The unity of electro-motive force is the Volt. It represents about the electro-motive force of a Daniell cell:

1 Volt.....= 0.9268 of Daniell.
1 Daniell.....= 1.079 " Volt.

The electro-motive force *E* of a

Daniell varies between 0.978 and	1.079 Volt.
Marie Davy is equal to.....	1.524 "
Leclanche (porous).....	1.481 "
Bunsen.....	1.964 "
Bichromate.....	2.028 "
Grove.....	1.956 "

Quantity or intensity is calculated in *ampheres*, and is equal to the electro-motive force divided by the total resistance of circuit in ohm.

Example:

$$I = \frac{E}{R}$$

I = intensity, E = electric motive-force, and R total resistance in ohms.

Suppose that the electro-motive force of a set of batteries be 20 volts and the resistance of the total circuit 10 ohms, we will have:

$$I = \frac{20}{10} = 2.$$ ampheres a second, or 2 *coulombs*.

A coulomb is, therefore, the equivalent of 1 amphere in one second.

If we want to calculate the force of a battery in horse power, we have the equation:

$$W = \frac{E\,I}{g}$$

w the work in horse-power, and g the acceleration of the earth. $g=9.81$ (when a body falls in *in vacuo*, the distance it travels in the *first second* is 9.81 meters).

Example:

Let us take the figures of the preceding example:

$$I = \frac{20}{10} = 2 \text{ coulombs.}$$

$$W = \frac{20 \times 2}{9.81} = 4.077$$

kilogrammeters per second. One horse power can lift 75 kilogrammes 1 meter high, or 75 kilogrammeters.

Therefore, by dividing 4.077 by 75 we will have 0.0543 of one horse-power per second. To resume: a battery having an electro-motive force of 20 volts, in a total resistance of circuit of 10 ohms, will give a work equal to 0.0543 horse-power.

The unity of electro-static capacity is calculated in *Farads*, and, according to the "Agenda Dunod," represents the capacity of a condensator placed in such conditions that the quantity of electricity transported by one volt through the resistance of one ohm will charge it at a tension of one volt. This sort of unity is applied in the study of sub-marine cables. It can be expressed by:

$C \times E$. C being the capacity.

A word which easily lead one in error is "*electrode.*" Some apply the word to the conductors of a battery, and it is generally used in that sense. Technically, however, it means *exactly the reverse.* The name of electrode is given to that part of the pole immersed in the liquid of a battery, and is always of a contrary sign to the part outside, and inactive. The positive pole is, therefore, the continuation *outside* of the battery of the negative electrode, and *vice versa.* When one says "positive electrode," he really refers to the zinc *in the battery.* GEORGE P. GRIGNARD.

Paris, July 15, 1882.

Electric Transmission of Power.

Professor Silvanus Thompson lately delivered at the Crystal Palace a lecture on this subject. Electricians, he said, had known for 50 years that an engine could be made to work by electric currents. They had known, for nearly a century, that such currents might be carried to any desired distance without diminution of strength by means of insulated metal wires. But it was only within the last 10 or 12 years that the invention of the dynamo-electric machine had rendered economically practicable the production of electric currents on a large enough scale to be of importance as a source of mechanical power or a means of conveying it from one place to another; and it was only within the last five or six years that they had begun to realize what an enormous power might be transmitted to great distances through a comparatively thin wire. The reversibility of these machines was then adverted to and illustrated. All or any of the many different kinds of dynamo would serve as a motor, and when supplied with a strong electric current from some independent source could be set in rotation and be made to do mechanical work for which steam or other power would else be required. Electric motors were shown in the Palace sawing planks, driving sewing machines, turning lathes, and working printing presses and other machinery. They might be utilized to work elevators such as Hopkinson's electric lift, and even, as Mr. Latimer Clark has shown, might be taken down by a diver to aid him in recovering a sunken ship. More recently electric tramways and railways had been devised, the great advantage of such systems being the relatively very light weight of the engine, which was less than 50 lb. of dead weight per horse-power, far less than any steam or gas engine. The difficulty in all the suggested systems of electric railways was that of getting the electric currents conveyed without loss into the engine. Everyone knew that in conveying electric currents two wires were necessary—a "leading" wire and a "return" wire, though the earth might be used for a return wire if desired. But the leading wire must be very carefully insulated to prevent the currents leaking out of it before they reach the engine. The difficulty lay in securing this necessary insulation along a long line. For long lines of railway there would be great difficulty in maintaining the "leading" wire from leakage while the latter was in perfect communication with the engine. Professors Perry and Ayrton had lately made a most ingenious proposal to divide the leading line, through which the engine drew its supply of currents, into a number of separate sections, each insulated from the other, each section being supplied with the current by means of a buried cable, with which it was put into temporary contact only when the train was on that section. These contacts being automatically made by the moving train itself, there was the remarkable additional advantage in this system that it would work as an absolute and automatic block system, in which it would be impossible for one train to follow another on the same section. Professors Perry and Ayrton proposed to do away with a special engine, and to drive the train by fixing a motor upon the axis of each pair of wheels on each carriage. Mr. Edison had also constructed experimental electrical railways; the first had worked at Menlo Park two years ago. He had just finished a new electric locomotive engine, resembling outwardly the American type of locomotive minus the smoke-stack. Storage batteries had also been suggested for propelling tram-cars, a tram-car actuated by Fauré's accumulators being actually at work at Leytonstone. The lecture doubted, however, whether the constant wear of transport would be economical in the case of accumulators. The very facility with which electricity could be transmitted by wires rendered its porterage by carrying heavy cells superfluous. You had only to carry a leading wire from the central works where the currents were generated to the workshop where it was wanted, and small electric motors were just as economical as large ones. Once let there be a great central electrical supply—as there must be if whole towns were to be lighted up by electricity—and the distribution of power electrically must inevitably follow, as it would undoubtedly supersede steam in small workshops, if not in large ones too. In the near future electricity was to be our servant, to do the hard work of the world in the place of our present servants, coal and steam. If electric power were as cheap on the small scale as on the large, concentration of workmen in a barrack-like factory would be unnecessary. Home work would be fostered, and the profits of labor would be more directly at the disposal of those who earned them. Small capital would have a fairer chance than now, and large capitalists would have a less chance of still further inflating their position at the expense of labor.

A New Electro-Dynamometer.

At the meeting of the Physical Society of London, which was recently held at the Charendon Laboratory, Oxford, an electro-dynamometer, which has some novel points of construction, was exhibited by Dr. W. H. Stone, F.R.S. It was designed for measuring the currents used in the medical applications of electricity, and originated in a suggestion of Mr. W. H. Preece, made at the Society of Telegraph Engineers, when Dr. Stone read a paper on "Medical Electricity," which we referred to in a recent note. The chief novelty in the new instrument is the use of aluminum wire instead of copper for the suspended coil. Aluminum is chosen because of its lightness as compared to copper, and its equal conductivity to copper, weight for weight. In an electro-dynamometer the movable coil ought to be as light as possible, other things being the same, as it plays the part of a needle and is deflected by the current just as the aluminum needle of a quadrant electrometer is deflected by the difference of potentials between the quadrants. The aluminum coil of Dr. Stone was made from silk covered wire prepared by Messrs. Johnson & Matthey, and is wound into without a frame, the convolutions being bound together by small ties of silk and a lacquer of amber varnish, such as is used by photographers. Dr. Stone recommends this varnish for delicate electrical uses instead of the ordinary shellac varnish. The coil is suspended from two fibers of silver gilt wire, such as is used in gold-lace making. This wire is gilt before it is drawn, and has a high conductivity. Thus a meter of wire $\frac{1}{500}$ inch in diameter measures 9.8 ohms, whereas a platinum wire of the same length and thickness measures 62.2 ohms. As the current is conveyed to the suspended coil by this wire, it is important to have it of low resistance. Moreover, the gilt surface makes a good clean contact with the aluminum wire of the coil, and thus overcomes one of the leading obstacles in the way of using aluminum wire for electrical purposes. Dr. Siemens and others have tried to use aluminum before, but the difficulty of getting a good soldered joint was found to be a drawback. The gold and aluminum clamped together or soldered after the aluminum is electro-plated with a solder-holding metal is likely, however, to answer the purpose. Aluminum has also a high specific heat, and is very difficult to fuse, therefore it is adaptable for resistance coils. The bifilar suspension is necessary in Dr. Stone's instrument to give the coil a directive force and bring it back to zero. The silver-gilt wires are hung from two brass springs placed horizontally and opposite each other. The springs can be drawn apart if need be by means of adjusting screws in order to vary the sensitiveness of the needle. The instrument is small in size, and of a portable construction.—*Engineering, London.*

Electric Light Apparatus.

The interest felt by all classes in the introduction of the electric light for household purposes is now so universal that the one great question is: "When shall we be able to have this light in our houses?" At present this is rather a difficult matter to deal with, for, notwithstanding all that has been gone through by the Parliamentary Electric Light Committee, we are now at a standstill as far as any important operation is concerned towards solving the problem of domestic illumination. Several well-known gentlemen with unlimited funds have provided for themselves the necessary apparatus wherewith to light their own mansions by means of the incandescent electric lamps, the result, after the first cost, being eminently satisfactory; but the laying down of the necessary plant involves the outlay of a considerable sum, and it is this first expense which is keeping back many who would otherwise invest in a private installation of the electric light. It would really be worth the consideration of electric light companies to endeavor, by a different design, or proportioning of the various parts of dynamo-electric machines, to materially cheapen them, so that the evident desires of many private persons with tolerably good incomes could be met. M. Marcel Deprez has lately demonstrated, both theoretically and experimentally, that a magnetic field of given intensity is least expensive to obtain when it is produced by electro-magnets of con-

siderable dimensions, and he recommends the employment of very powerful inducers surrounded with a *moderate quantity* (the italics are ours) of wire.

It is the wire for winding the bobbins and electro-magnets of these machines which constitutes the most expensive item in their construction, and we quite believe that the electro-magnets may be made much more cheaply and yet be equally as efficient as those now employed. As far as arc electric lamps are concerned, it is not probable that they will trench upon the subject of domestic illumination beyond a slight degree; but as they, too, have their special uses, cheapness in their construction is most desirable. Apparently the lamps of this type which have had the greatest sale have been the most costly, but it is easy to imagine that the demand for them would have been more than quadrupled had their price been reduced to one-fourth of their present scale. There is, however, every possibility of great reduction on this point; for there is, at least, one lamp lately brought before the public which can be made for a few shillings, and will last in action thirty or forty hours without recharging. Even presuming that the use of such a lamp entails the cost of 10 or 20 per cent. extra horse-power, its enormously reduced first cost and ease of manipulation will outweigh such consideration, more especially where the supply of power is unlimited The question of consumption of carbon, and also of the manufacture of the carbon itself, is of the greatest importance. It will be seen, in the description of the illumination of the North Brussels Telegraph Office in our other pages, that of many experiments with retort and artificially-produced carbons, the best results were obtained with the former. Of course, gas carbon could not economically be used with the ordinary arc lamps; therefore, any system which can employ short and roughly-shaped pieces of gas carbon has a certain advantage over those which necessarily burn carbons artificially made. The manufacture of incandescent lamps has made more progress towards the end in view than any other part of an electric light system; and on the score of expense there is certainly but little to complain of, considering their lasting capabilities, when not forced beyond a normal illuminating power.—*Electrical Review, London*

Fire Risks from Electric Lighting (in London).

Rules and regulations for the prevention of fire risks arising from electric lighting, recommended by the Council of the Society of Telegraph Engineers and of Electricians in accordance with the report of the committee appointed by them on May 11, 1882, to consider the subject.

Members of the committee—Professor W. G. Adams, F. R. S., vice-president; Sir Charles T. Bright; T. Russell Crampton; R. E. Crompton; W. Crookes, F. R. S.; Warren De la Rue, D. C. L., F. R. S.; Professor G. C. Foster, F. R. S., past president; Edward Graves; J. E. H. Gordon; Dr. J. Hopkinson, F.R.S.; Professor D. E. Hughes, F. R. S., vice president; W. H. Preece, F. R. S., past president; Alexander Siemens; C. E. Spagnoletti, vice-president; James N. Shoolbred; Augustus Stroh; Sir William Thompson, F. R. S., past president; Lieut.Colonel C. E. Webber, R. E., president.

These rules and regulations are drawn up not only for the guidance and instruction of those who have electric lighting apparatus installed on their premises, but for the reduction to a mimimum of those risks of fire which are inherent to every system of artificial illumination.

The chief dangers of every new application of electricity arise mainly from ignorance and inexperience on the part of those who supply and fit up the requisite plant.

The difficulties that beset the electrical engineer are chiefly internal and invisible, and they can only be effectually guarded against by "testing" or probing with electric currents. They depend chiefly on leakage, undue resistance in the conductor, and bad joints, which lead to waste of energy and the production of heat. These defects can only be detected by measuring, by means of special apparatus, the currents that are, either ordinarily or for the purpose of testing, passed through the circuit. Bare or exposed conductors should always be within visual inspection, since the accidental falling on to, or the thoughtless placing of other conducting bodies upon, such conductors might lead to "short circuiting" or the sudden generation of heat due to a powerful current of electricity in conductors too small to carry it.

It cannot be too strongly urged that amongst the chief enemies to be guarded against are the presence of moisture and the use of "earth" as part of the circuit. Moisture leads to loss of current and to the destructron of the conductor by electrolytic corrosion, and the injudicious use of "earth" as a part of the circuit tends to magnify every other source of difficulty and danger.

The chief element of safety is in the employment of skilled and experienced electricians to supervise the work.

I. The Dynamo Machine.

1. The dynamo machine should be fixed in a dry place.

2. It should not be exposed to dust or flyings.

3. It should be kept perfectly clean and its bearings well oiled.

4. The insulation of its coils and conductors should be perfect.

5. It is better, when practicable, to fix it on an insulating bed.

6. All conductors in the dynamo room should be firmly supported, well insulated, conveniently arranged for inspection, and marked or numbered.

II. The Wires.

7. Every switch or communicator used for turning the current on or off should be constructed so that when it is moved and left to itself it cannot permit of a permanent arc or of heating, and its stand should be made of slate, stoneware, or some other incombustible substance.

8. There should be in connection with the main circuit a safety fuse constructed of easily fusible metal which would be melted if the current attain any undue magnitude, and would thus cause the circuit to be broken.

9. Every part of the circuit should be so determined that the gauge of wire to be used is properly proportioned to the currents it will have to carry, and changes of circuit, from a larger to a smaller conductor, should be sufficiently protected with suitable safety fuses so that no portion of the conductor should ever be allowed to attain a temperature exceeding 150° F.

N. B. — These fuses are of the very essence of safety. They should always be enclosed in incombustible cases. Even if wires become perceptibly warmed by the ordinary current, it is a proof that they are too small for the work they have to do, and that they ought to be replaced by larger wires.

10. Under ordinary circumstances, complete metallic circuits should be used, and the employment of gas or water pipes as conductors, for the purpose of completing the circuit, should in no case be allowed.

11. Where bare wire out of doors rests on insulating supports, it should be coated with insulating material, such as india-rubber tape or tube, for at least two feet on each side of the support.

12. Bare wires passing over the tops of houses should never be less than seven feet clear of any part of the roof, and they should invariably be high enough, when crossing thoroughfares, to allow fire escapes to pass under them.

13. It is most essential that the joints should be electrically and mechanically perfect.

14. The position of wires when underground should be efficiently indicated, and they should be laid down so as to be easily inspected and repaired.

15. All wires used for indoor purposes should be efficiently insulated.

16. When these wires pass through roofs, floors, walls, or partitions, or where they cross or are liable to touch metallic masses like iron girders or pipes, they should be thoroughly protected from abrasion with each other or with the metallic masses, by suitable additional covering; and where they are liable to abrasion from any cause or to the depredations of rats or mice, they should be efficiently encased in some hard material.

17. Where wires are put out of sight, as beneath flooring, they should be thoroughly protected from mechanical injury, and their position should be indicated.

N. B.—The value of frequently testing the wires cannot be too strongly urged. It is an operation, skill in which is easily acquired and applied. The escape of electricity cannot be detected by the sense of smell as can gas, but it can be detected by apparatus far more certain and delicate. Leakage not only means waste, but in the presence of moisture it means destruction of the conductor and its insulating covering, by electric action.

III. Lamps.

18. Arc lamps should always be guarded by proper lanterns, to prevent danger from falling incandescent pieces of carbon, and from ascending sparks Their globes should be protected with wire netting.

19 The lanterns, and all parts which are to be handled, should be insulated from the circuit.

IV. Danger to Person.

20. To secure persons from danger inside buildings, it is essential so to arrange the conductors and fittings that no one can be exposed to the shocks of alternating currents exceeding 60 volts; and that there should never be a difference of potential of more than 200 volts between any two points in the same room.

21. If the difference of potential within any house exceeds 200 volts, whether the source of electricity be external or internal, the house should be provided outside with a "switch" so arranged that the supply of electricity can be at once cut off.

By order of the Council,

F. H. WEBB, *Secretary.*

Carbons for the Electric Light.

At a meeting of the Paris Academy of Science, M. Jacquelain pointed out that carbon for the electric light should be purer than that obtained by calcining wood; and, if not free from hydrogen, should, at any rate, contain no mineral impurities. There are three methods for accomplishing this result: (1.) By the action of a jet of dry chlorine gas directed on the carbon, raised to a light red heat; (2), by the action of potash and caustic soda in fusion; and (3), by the action of hydrofluoric acid on the finished carbons. M. Jacquelain has prepared carbons by all three methods, and has summed up in a table the photometric results of his experiments. He comes to the conclusion that the luminous power and the regularity of the voltaic arc increase in direct ratio to the density, hardness and purity of the carbons. He remarked, incidentally, that the natural graphitoïd of Siberia possesses the singular and unexpected property of acquiring by purification a luminous capacity double that which it has in the natural state, and which exceeds by one sixth that of pure artificial carbons.

A Chance for Inventors.—A prize of $10,000 is offered by the French Government to any person who between July 1, 1882, and July 1, 1887, will have invented the most useful application of the Volta pile.

Telegraphic and Telephonic Notes.

In a new decision by the Missouri Court of Appeals, in the matter of a property-owner's petition for injunction against a telegraph company, which had put up a pole opposite his premises under a permit from the Board of Public Improvements, it was stated that the power of the Board to give such permits might be so limited as to exclude the erection of anything unsightly.

South American Cables.

SALINA CRUZ, Mexico.—The cable steamers Retriever and Silverton have landed the shore ends of the cables on the coasts of the Central American States, and will leave Tehuantepec on Thursday, laying the cable southward to Panama, thus completing telegraphic communication from Valparaiso northward. The cables will be open to the public in August.

The B. and O. Telegraph Line.

Messrs. Robert Stewart, of Baltimore; Charles McLaughlin, of Paterson; A. J. Smith, of Hightstown; John A. Hall and J. C. Hankinson, of Trenton, met in Bordentown Tuesday, and held a consultation in reference to the building of the Baltimore and Ohio Telegraph Company through New Jersey. The route has been planned and the right-of-way has been obtained. In a few weeks it is proposed to run the wires from South Amboy to Camden. The line is to run *via* the Camden and Hightstown Railway.

The Post-office and the Telephone in England.

It is brought to us on reliable authority that the Postmaster-General contemplates giving up the erection of private telephone lines, and as far as exchanges are concerned, the Post-office authorities will not interfere as long as their own interests are not invaded. It appears from this, therefore, that telephone exchanges, with but few exceptions, will soon be thrown open to all. Should this be true, a great impetus will be given to telephony, which is, comparatively, now almost at a standstill, albeit the telephone is the most wonderful invention of the age.

The improvement and extension of the State telegraph system is under the consideration of the Government. In a report of the 2d inst. the Director-General of telegraphs recommends the establishment of offices at Pena Blanca, Paiguano, Tongoy, Panulcillo, Palmilla, Matanzas, San Antonio de las Bodegas, Llico, Vichuguen, Curepto, Florida, Curanipe and Castro, the last-mentioned place being on Chiloe Island. The estimated cost of the extensions is a little over 74,000 dollars. The director also points out the necessity of laying an additional wire from Iquique to Canete, the present line being totally inadequate to meet the requirements of the public. If the proposed extensions should be carried out, and we presume they will be, the total length of the State telegraph lines will be 14,265 kilometers.

The Telephone in the Country.

The use of the telephone in New York City has become so general that we take it as a matter of course. Business would be seriously crippled without it Perhaps we do not realize, however, how rapidly the system is extending in the interior. In the Utica *Herald* of yesterday there is an interesting account of the development of the lines in that part of the State. It appears that through this part of the State the rights of the American Bell Telephone and Telegraph Company have been largely sold. At Albany the Commercial Telephone Company owns rights for Montgomery, Fulton, Saratoga, Albany, Schoharie and Rensselaer counties. This company is a very strong one, and its next directory, soon to come from the printer, will contain 2,200 names. Its lines connect Troy and Albany, Lansingburgh, Cohoes, West Troy and other points in the immediate vicinity with Saratoga, Amsterdam, Gloversville, Johnstown and a number of other villages some distance away. A line runs also in Schoharie county.

The Watertown Company controls the rights in that city and in the counties of Jefferson, Lewis, St. Lawrence, Essex, Clinton and Franklin. The Mohawk Valley Company's territory includes most of Oneida county, together with Otsego, Madison and Chenango. Onondaga, except the city of Syracuse, Cayuga, Ontario, Cortland and Oswego counties are controlled by the Empire State Telephone and Telegraph Company. This company uses the magneto system, by which the electricity is developed by the operator's turning a crank, instead of depending on a battery. It is rapidly extending its lines throughout the entire territory under its control.

Other companies are doing the same throughout the State, so that soon there will be a network of wires extending to every village.

The distances through which messages are sent do not as yet exceed twenty-five to thirty miles; but with the improvements now making, the day is probably not far distant when communication may be held between points much more widely sundered.

The charges for using the telephones vary according to distance, but are in all cases less than telegraph rates, while at the same time, instead of being restricted to a certain number of words, the sender may hold a five minutes' conversation.—*Ex.*

The Telephonic Systems of Dr. Herz.

M. du Moncel has thoroughly studied the different telephonic systems of Dr. Cornelius Herz, and the object of the present article is to describe some new experiments, and especially the efforts which have been made to simplify the apparatus and give it a practical and convenient form.

The apparatus is specially designed for lines most affected by induction, which renders communication impossible with ordinary telephones.

This plan utilizes two principles discovered by Dr. Herz; the alteration of the current in the line, and employing condensers as receivers. The instrument constitutes a station, completely inclosing, under a compact and appropriate form, all the parts necessary for the call and for communication.

The diaphragm is horizontal, but a funnel placed in front of the box collects the sound and concentrates it upon the diaphragm, and the instrument will transmit words spoken fifty centimeters from it.

Four pairs of microphonic contacts are placed upon an oscillating platform, under the diaphragm and connected with it by a rigid rod, communicating to it all the vibrations of the diaphragm. These contacts are of a special composition, and communicate with the battery and with the line.

In this apparatus it is not necessary to use the induction coil, but it is necessary that the number of elements of the battery in the line be proportioned to the distance of the two stations; for example, between Paris and Orleans it was necessary to use thirty elements of Daniell at each station, in order to obtain the maximum intensity. Besides, the condensers have to be charged, in order to reproduce speech, so that it is necessary to employ another battery which is interposed in the line It would seem at first sight that the number of elements employed would perhaps be an obstacle to the use of this apparatus, but it must not be forgotten, on the one hand, that the battery designed to charge the condenser, working always in an open circuit, costs very little, and on the other hand, the instrument is designed to work over lines where the employment of magneto receivers would be impossible.

The instruments which are the subject of this article put in practice three principles adapted to facilitate communication in various circumstances. These principles are the employment of condensers as receivers, the alternation of the current in the line, and the system of derived circuits. This does not form, altogether, a new method of telephonic communication, but either of them may be employed in cases where their application is specially indicated, and they constitute an important modification of the telephone.—*A. Noailon, in La Lumiere Electrique.*

The Telephone Business in the Netherlands.

To Mr. George Worthington, Editor and Proprietor of the Review of the Telegraph and Telephone:

DEAR SIR,—Being a subscriber to your interesting paper, and having taken notice of your editorial announcement, I take the liberty to forward to you a short account of the progress of the telephone in Holland. In connection with the International Bell Telephone Company of New York, which has its central station for Europe in Antwerp (Belgium) a local company, the *Nederlandsche Bell-Telephoon Haatschappij* (Director Dr. H. F. R. Hubrecht, of Amsterdam), was established in December, 1880.

The first station in our country has been erected in Amsterdam, the first commercial town in Holland. By this time there are about 720 subscribers.

The engineering work of this station was started by J. Sitzenstatter, carried on by J. Crawford, and is now in the hands of M. S. Baxter.

In Rotterdam, the second commercial town, the Dutch Bell Telephone Company has already about 310 subscribers. The work is laid out by the skillful engineer, J. M. Seymour, of New York, which gentleman has also been engaged to superintend the work at Arnheim and the Hague, a proof that his services are highly appreciated.

The system adopted by our company is the Bell and Blake instrument, in connection with the Gilliland Magneto-Bell. In the central offices Gilliland switchboards are used. The company has also got the concessions for other districts and places as Groningen, Utrecht, Tilberg, etc.

Hoping to be able at another time to contribute more particulars about the matter to the columns of your paper. I remain, dear sir, yours respectfully,

Rotterdam, July 13, 1882. V.

The Telelogue.

Some experiments which have recently been made in the Tuileries Gardens are believed to have pretty well proved that the invention of a French officer of the line, known as the telelogue, is destined to be used with some success in military operations. The apparatus consists of a three-legged easel or frame, surmounted by a field glass, and arranged conveniently for the exhibition of the signals to be used. The only other thing required is the case containing these signals. This is flat, with a double folding lid, opening when required so as to display the plate within. It is fitted with 36 plates, each of which has a plain black ground, with a shining white letter or mark raised upon it. The plates fit in like books into a shelf, and have marks on their outer edges, forming a sort of index, and enabling the operator to pick out at a glance the one required. Usually the marks on the plates are simply the 25 letters of the alphabet, and the 10 Arabic units of number, but whenever it is desired these can be replaced by others having a secret meaning, and decipherable only by a friend, while useless as a means of conveying information to

an enemy. The size of the plates varies according to the distance which it is intended that they should "carry." For the purpose of communicating at a distance of 2½ miles, they are about 17 in. high and 12 in. wide, but by doubling the length and breadth of them they are made useful at considerably more than double that distance. In the former case, however, the weight is only 4 pounds, whereas in the latter it is raised to 20 pounds or more. In one of the experiments conducted at the Tuileries, communications were carried on between the operator in Paris and the race-course at Longchamps, which is a distance of about three miles, and the results were said to be altogether successful. One of the chief advantages of the system is, of course, its cheapness and simplicity, which would enable any private soldier, after a very few lessons, to work it with success.

Whenever any patent is inoperative or invalid by reason of a defective or insufficient specification or by reason of the patentee claiming as his own invention or discovery more than he had a right to claim as new, if the error has arisen by inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, the Commissioner shall, on the surrender of such patent and the payment of the duty required by law, cause a new patent for the same invention, and in accordance with the corrected specification, to be issued to the patentee.

Government and the Telephone.

The statement of Mr. Fawcett in the House of Commons, that the Government has no intention of purchasing the business of any telephone company, is calculated to have a certain influence on the values of this class of enterprise, and it coincides with the conclusion of a long and very interesting trial regarding the same marvelous application of science. The case of "The United Telephone Company *v.* Harrison, Cox-Walker & Co.," after consuming, wholly or partially, no less than sixteen days of the time of the Chancery Division of the High Court of Justice, has at length terminated in a decision which is practically, although not on every issue, in favor of the plaintiff company. This company has become the possessors by purchase of the patent rights in this country of the two principal telephonic inventors, Professor Graham Bell and Mr. Edison, and it sought to restrain the defendants, who are makers of philosophical instruments, from making and selling telephones which were alleged to be infringements of these patents. An imposing array of counsel, and a still more imposing array of costly scientific witnesses, have been engaged both in the attack and in the defence; the latter having mainly rested, as regards the alleged infringement of Professor Graham Bell's patent, upon the contention that its essential features were disclosed prior to the date at which the patent was taken out, in a communication made by Sir William Thomson, as a result of information received from Professor Bell, to the British Association for the Advancement of Science; and, as regards the patent of Mr. Edison, upon supposed anticipations of its principle by earlier inventors. The defence, therefore, amounted to this, that Professor Bell, by his communication to Sir William Thomson, deprived himself of the protection to which he would otherwise have been entitled, and that Mr. Edison, in his improvements upon the Bell telephone, did but utilize knowledge which had been the common property of men of science before telephones were thought of. Of these two distinct questions, the first is, no doubt, one which a Court of Law may with propriety be called upon to determine; and, in view of the manifest unfairness of allowing the publication of a scientific discovery to deprive the discoverer of its possibly unsuspected commercial value, it is satisfactory to read Mr. Justice Fry's decision that Sir William Thomson's exhibition of Bell's instrument, in an incomplete and experimental stage, was not sufficient to invalidate the patent which he subsequently obtained. The second question, which calls for a minute knowledge of scientific details, is one which the examination or cross-examination of witnesses, as ordinarily conducted, is scarcely fitted to clear up, and which would be more satisfactorily settled by reference to a committee of experts, or by some analogous contrivance. When witnesses learned in physical science are themselves in hopeless opposition, it is difficult for a Judge, unless he also is deeply learned in the same direction, to decide between them otherwise than at haphazard; and there is, perhaps, no conceivable process less calculated to elicit the truth in any such controversy than a trial in a Court of Law. This is daily seen, on a somewhat smaller scale, in actions for compensation on account of personal injuries; and the questions relating to scientific patents, as they are still more removed from the domain of common sense and the range of ordinary conversation, present the same difficulties in a greatly increased degree.

In the instance under consideration, both plaintiffs and defendants have fought in a manner which showed that they had the sinews of war at their command. There are, however, other instances, and those neither few nor unimportant, in which inventors are unable to defend their rights against powerful and wealthy persons or corporations, and in which they are practically robbed of all the fruits of the application, self-denial, and labor of years. The faults of the existing patent laws, and the abuses incidental to their application, are so manifest that many have suggested a short way of dealing with these evils by the total abolition of the laws themselves. Such a proposal will not bear the test of examination. The prospect of reward is the greatest, and with a large class of persons the only, inducement to labor; and, even if it be true that many inventions owe their origin to the love of pure science and to the pursuit of truth, yet it is at least certain that the perfecting even of these, and the origination of vast numbers of a less important kind, which, nevertheless in the aggregate, greatly promote the comfort and convenience of the public, are mainly due to the confidence which the improver or the inventor feels in the patent laws, or, more correctly, in the principle which these laws imperfectly express, as a means of securing to him the reward which he feels to be his due. One of the most distinguished inventors in this country is a foreigner, who has publicly declared that he settled in England mainly on account of the facilities which he here enjoys for obtaining patents for his inventions. In America, where patents are granted very cheaply and easily, their influence upon the improvement of small conveniences is widely felt, and it is commonly said to be worth a man's while to take out a patent for any invention, however seemingly insignificant, which promises to afford him a profit of a hundred dollars. The result is seen in innumerable domestic and other contrivances, in some way better or more convenient than those which they are intended to supersede; while in England analogous improvements are not brought to maturity, because they are not worth the cost of a patent, and are certain to be pirated if left unprotected. To place the patent laws upon a sound basis would be an achievement worthy of a statesman, but is precisely one of the tasks which, being calculated to benefit only an orderly and law abiding class, is certain, under the influence of party government, to be postponed to the demands of agitators. It will hereafter be looked upon as a disgrace to our generation that inventors should be taxed to the extent which our present patent laws permit. They are a class to which the country owes much of its prosperity, and yet we withdraw enormous sums from their pockets, which are often the pockets of poor and struggling men, merely to give them a nominal and delusive property in the creations of their own brains, a property which amounts to little more than the right to defend themselves in a Court of Law if they are attacked. The demand is urgent for a reform by which patents will be granted with discrimination, by which the fees will be reduced to the lowest point compatible with the working of the necessary machinery, and by which some means would be provided of bringing disputes touching infringement under the cognizance of an inexpensive and a competent tribunal. A judge or magistrate, sitting with assessors skilled in the matter in hand, would decide most patent questions more quickly, and also more correctly, than the costly apparatus of the Court of Chancery. As good oftentimes comes out of evil, the great telephone trial will not be altogether fruitless if it should serve to promote the advent of changes which are greatly needed.—*Inventor's Record.*

Another Telephonic Discovery.

In the course of experiments on magnetic currents, Mr. Willoughby Smith has made a remarkable discovery—one that may possibly have an important influence on the future of telephony. It is well known to those who have ever had a magnet, that it acts upon pieces of iron, even though an ordinary table-top intervenes; the mysterious "property" (for want of a more definite term) which enables a magnet to attract iron being uninfluenced by the presence of other matter. It is this property which is at the basis of Mr. Smith's discovery—a discovery that leads to the idea that ultimately we may be able to telephone without having any connecting wires. The apparatus employed in this, the earliest stage of the discovery, is very simple, consisting merely of a large tuning-fork and a flat coil or disc of insulated wire, with a suitable battery. The fork is arranged with a small electro-magnet between the prongs, which, when a current is passed through its coil, prolongs the vibrations of the fork indefinitely. On one of the arms of the fork is a contact piece, which makes and breaks the circuit, so that the current is alternately sent through the main line or a shorter circuit. In the main line is the disc, or coil of wire, which is confined between two sheets of card-board placed in a frame. The current traversing this coil sets up what are known as magnetic lines of force, which act indirectly on pieces of "iron" moved in the field, the effect varying with the number of lines of force impinging on the "iron," which may have any form, from a telephone diaphragm to a kitchen poker.

Here comes in the discovery. If a tuning-fork so arranged is set in motion, its vibrations are continued by the action of the electro-magnet, and magnetic lines of force are created in the coil of insulated wire; a telephone diaphragm preferably, but it may be a plate of iron, is then held in such a manner that these invisible lines of force can impinge upon it, and it reproduces the note sounded by the tuning-fork, although there is no visible connection between it and the disc-coil. In reality, the sound is heard only at the time of the make or break in the circuit, and the rapidity with which the make-and-break is made determines the pitch of the note. To a large extent that depends on the length of the arms of the tuning-fork, but with suitable arrangements that is so rapid there is no perceptible interval, and the telephone diaphragm, held within the influence of the lines of the disc-coil, reproduces with exactness the sounds due to the rapidity of the vibration of the tuning-fork.

The discovery derives importance from the fact that, so long as the receiving diaphragm is held in such a position that these invisible lines of magnetic force can impinge upon it, a brick wall or two and many feet of air make no difference in the result, although there is no apparent connection whatever between the receiver and the transmitter.

On the Influence of the Positive Electrode of the Battery Upon its Chemical Work.

BY M. D. TOMMASI.

In my researches upon electrolysis I have ascertained the singular fact that the electromotive force of one and the same couple may vary according as the positive electrode is of platinum or of coke. An element, *e.g.*, which is incapable of effecting the electrolysis of water or a saline solution, although the calories which it disengages are greater than the calories absorbed by the decomposition of the electrolyte, if its positive electrode is of platinum, becomes able to produce such a decomposition if its positive electrode is of coke. As this fact is of great importance as regards the relation which I am seeking to establish between the calories liberated by the battery and the calories absorbed by the decomposition of the electrolyte, I have examined it in some detail, and have made the following observations :—

A magnesium platinum couple in dilute sulphuric acid ought, according to thermic data, to decompose water ; the number of calories liberated by the action of magnesium upon dilute sulphuric acid (112) is greater than the number of calories of the decomposition of water (69). Nevertheless the decomposition does not take place. It is the same if we substitute copper or silver for the platinum of the element, but if we use as a positive electrode a cylinder of graphite or of coke, the electrolysis of the water takes place.

According to M. Berthelot, two zinc-platinum elements with dilute sulphuric acid do not decompose a solution of sulphate of potash. But on employing two zinc-carbon elements with dilute sulphuric acid, I have been able to electrolyze a saturated solution of sulphate of potash with a copious liberation of gas at the two platinum electrodes, and a transfer of the acid to the positive electrode and of the base to the negative electrode, and this in the lapse of a few minutes and at the common temperature. There are required, according to M. Berthelot, at least 103 cal. to electrolyze a solution of sulphate of potash, whilst I obtain this same decomposition with 76 cal. and even fewer, for it is produced with two zinc-carbon elements and dilute hydrochloric acid, say with 69.8 cal. (calories disengaged by the action of a molecule of amalgamated zinc upon dilute hydrochloric acid.) A single zinc-coke element with dilute sulphuric acid decomposes sulphate of potash if the electrode of the voltameter is of copper, but not if the electrode is of silver.

I have submitted various salts to electrolysis. The conditions of the experiments are as follows :—The saline solutions contained an excess of salt. The platinum wires of the voltameter were 0.4 mm. in diameter, and plunged into the liquid to a depth of 0.3 to 9.4 meter. The carbons employed were Siberian graphite or gas coke previously heated to redness and cooled in a stoppered bottle containing air, nitrogen, and by preference, carbonic acid. To obtain good results, the coke or the graphite should remain at least six hours in contact with carbonic acid. The presence of this gas in the pores of the coke has no other object than to retard the polarization, rendering consequently the effects more intense and giving them a longer duration. Two zinc-carbon elements with dilute sulphuric acid (=77.4 cal.) decompose the following saline solutions:—Sulphates of magnesia, zinc, cadmium, copper, manganese, iron, chloride, bromide, and iodide of potassium.—*Comptes Rendus.*

Electro-Technology will form a part of the course in future in the Stuttgart Polytechnic School, and experiments, as well as lectures, will be given. All the branches of electric industry will be taught, and practically exemplified.

The Electric Tensions Between a Metal and Liquids of Different Concentration.

BY ERASMUS KITTLER.

The author has made a long series of determinations of the differences of tension of certain chlorides in various combinations. The results are here given, our readers being referred to the original for the details of the observations.

If in the combination : copper | solution + solution | copper sulphate + copper sulphate | copper, there are substituted successively the concentrated aqueous solution of chlorides of potassium, sodium, ammonium, lithium, calcium, strontium, barium, magnesium, manganese, and nickel, there are obtained on using a dilute solution of sulphate of copper (0.6 parts to 100 of water) the following electromotive forces ; chloride of ammonium = 0.318 Daniell ; chloride of potassium=0.315 D. ; chloride of lithium =0.308 D. ; chloride of calcium=0.304 D. ; chloride of sodium = 0.302 D. ; chloride of strontium = 0.290 D. ; chloride of magnesium = 0.275 D. ; chloride of barium = 0.251 D. ; chloride of manganese = 0.247 D. ; chloride of nickel = 0.231 D. The series in which these chlorides fall remains the same if distilled water is used instead of solution of sulphate of copper.

If dilutions of these chlorides are used instead of saturated solutions the electromotive force of the elements decreases with the proportion of the salt in the solution, whether in presence of sulphate of copper or of distilled water. The influence of the concentration of the chlorides upon the electromotive force is very considerable. The difference is greatest with chloride of ammonium, and smallest with chloride of sodium.

The arrangement : copper | $L_1 + L_1$ | $L_2 + L_2$ | copper, in which L_1 and L_2 represent saline solutions of different degrees of concentration, give a current in the direction from L_1 to L_2. The current consequently passes from the chloride to the sulphate of copper, or to water, and from the more concentrated to the more dilute solution.

Volta's law of tension holds good for solutions of the above chlorides of different strengths in contact with distilled water, and a solution of sulphate of copper.

The combination : copper | solution + solution | sulphuric acid + sulphuric acid | copper, yields for the saturated solutions of the chlorides above mentioned a different series than the above combination with sulphate of copper. Here chloride of calcium gives the greatest electromotive force = 0.335 D. ; then follows chloride of strontium = 0.331 D. ; chloride of lithium = 0.323 D. ; chloride of magnesium = 0 321 D. ; chloride of manganese = 0.294 D. ; chloride of ammonium = 0.283 D. ; chloride of sodium = 0.287 D. ; chloride of nickel = 0.265 D. ; chloride of barium = 0.254 D.

Here also the electromotive force decreases with the proportion of salt in the solution, but the influence of the degree of concentration is here more prominent than in the former combinations. The current passes in this combination from the chloride to the acid, but if very dilute solutions are used, from the acid to the chloride or to water ; the law of tension does not hold good for the chlorides in contact with dilute sulphuric acid. The electromotive force of the liquid combination: sulphate of copper | solution + solution | sulphuric acid + sulphuric acid | sulphate of copper, in whtch the members, sulphate of copper and sulphuric acid, remain constant, changes considerably with the proportion of saline matter in the solution.—*Ex.*

Western Union stock, 90⅝.
American District Tel. stock, 58½.

The splendid dining-room and picture gallery, together with the grand staircase of Stafford House, the residence of the Duke of Sutherland in Mayfair, have now been fitted up with the incandescent electric light. The lamps are those of Lane-Fox, as supplied by the British Electric Light Company, and the arrangements have been made by Mr. W. Mackie, who has been entirely successful in producing a fine effect. There are about 250 lamps displacing 8,000 wax candles, and they are fed by the current from six Gramme machines of B type. The field magnets of these machines are excited by the current from two E Gramme machines, it being found preferable to adopt this plan The power is derived from a 20 H. P. (nominal) steam engine built by Marshall. The lamps are all in parallel circuit, so that the total resistance of the lighting circuit, including leading wires of copper, is only 0.6 ohms. The leads consist of copper strand wires ⅜ of an inch in diameter, properly insulated and protected. The pure character of the incandescent light, together with its sanitary and artistic advantages, is causing it to make its way in West End mansions.

Rent for Telegraph Lines.

Argument was heard by Judge Haight in Supreme Court Chambers to-day upon a motion to reopen a hearing before the Referee in an action brought by the New York and Western Union Telegraph Company against Hugh J. Jewett as Receiver, etc. Many years ago a contract was entered into between the plaintiff company and the old Erie Railway Company, whereby the latter had the use of the telegraph lines of the New York and Western Union Company. The lease some years later expired, and after the expiration most of the lines became ruined, and there remained but a single telegraph wire, which came into the possession of Mr. Hugh J. Jewett in 1879, when he was appointed by the Court as Receiver of the Erie Railway Company. When Mr. Jewett was appointed Receiver the plaintiff brought this action, asking that the Receiver be required to pay rent for the use of the wires. The case was referred, and the Referee reported that the rent of the lines was valued at nearly $6,000. The plaintiff then sought to have the question as to the value of the use of the wires more fully gone into, and an order to this effect was made, which was also affirmed by the General Term.

The case came up to-day upon a motion that the plaintiffs have leave to go back to the Referee to obtain further proof as to the value of the use of the wires. Mr. W. W. McFarland, who opposed the motion, claimed that the Receiver had sold all the property which had been in his possession under foreclosure, and by the order of the court he had parted with everything belonging to the trust fund. Counsel contended that this proceeding against Mr. Jewett, as Receiver, could not be held, inasmuch as Mr. Jewett had disposed of his trust, and had been discharged from his position by the court; that as he is not now Receiver, having been dismissed by the court, he cannot now be sued as such Receiver.

In support of the motion, Mr. Winslow argued that the plaintiffs had received no notice of the Receiver's application to be dscharged from his trust, and as the action had been instituted before his discharge from the Receivership, this proceeding was justifiable, to go back before the Referee and obtain further proof.

Decision was reserved.

Admiral Nicholson.

Our Admiral at Alexandria did the right thing at the right time. The conduct of the American officers and marines reflected credit on the United States.—*Pittsburg Evening Chronicle.*

Miscellaneous Notes and Facts.

"Down Brakes" by Electricity.

An Exhibition of an electro-magnetic brake was given on the New York, Woodhaven and Rockaway Railroad at Rockaway Beach yesterday. A train of freight cars ran out of the depot about noon. On the right side of the engine were a dynamo-electric machine and a small rotary engine, close to the engineer's cab. Wires led to the next freight car from this machine, and by an ingenious device conveyed the power to the shoes which stop the motion of the wheels. Several experiments were made, and each time the train was quickly and smoothly stopped, as the electric power was simultaneously applied to every car. The engineer was alone in control in starting or stopping. A turn of a valve sent the steam into the rotary engine, which at once started the dynamo-electric machine, which put down the brakes and brought the train to a stop within a space but little more than its own length.

The Egyptian Army.

There is an account of the Egyptian army in the *Kolnische Zeitung*, which is of especial interest just now. It consisted a few years ago of 50,000 men with 200 cannon; but was reduced on the deposition of the Khedive Ismael. The present Khedive, by the terms of his firman of investiture, is limited to 18,000 men; this number, however, may be increased if he can get the Sultan's assent. The actual force at present available in Egypt is said to be about 3,000 infantry and 1,000 cavalry in Lower Egypt, and about 8,000 infantry and 3,000 cavalry in the Soudan. The infantry are armed with Remington rifles, and the field artillery with Krupp breech-loading guns. The fighting powers of all these troops are very dubious indeed. Those in the Soudan have been beaten again and again by the Abyssinian King John, whose fortune was made by the Abyssinian expedition, and in any case, they could not be withdrawn for the defence of Lower Egypt. The German military authorities, however, consider that it would not be hard to raise 50,000 fighting men of fair quality.

Discoveries and Inventions the only Stable Capital.

Mr. Edward Atkinson says: "There is one form of fixed capital, which has been steadily increasing for all time, but which has accumulated more rapidly during the last century than ever before. It is the only kind of capital that has any stability, and the only kind that is of any permanent use in the world. It becomes in a very short time the common property of all, and is therefore one of the most substantial examples of communism which can be cited.

"This capital consists in the inventions and discoveries in applied science—the immaterial capital of the world. The representatives of this work, without whom those who are known as great capitalists would be powerless, are the theorists in science; the men, who, having combined the results of observations first indulge in bold hypotheses, then venture upon experiments, and lastly construct true theories, in accordance with which practical men work out the applications of science to art and industry. These men are the great instruments for promoting the common good of humanity; and they, together with those who level the ways and remove the material obstructions to commerce by carrying the rails over mountain sides, through tunnels and across the great plains, or who send ships across the sea, 'weaving the web of concord among nations,' are the chosen prophets, the elect among men, who are surely bringing about the solidarity of nations, rendering subsistence easy and certain, and bringing to the people of all lands the common enjoyment of the gifts of the Creator."

Suggestions for Patent Reform.

For the week ending June 6 the Patent Office issued 412 patents, 6 reissues, 11 designs, 15 certificates of registration, and sundry registration certificates for labels; the receipts from this business were $15,002. This was the largest week's business ever done, and was at the rate of 21,424 issues per year, and $780,000 receipts. The American patent system is peculiar, and the patent system is peculiarly American. The Patent Office was founded in 1837, but down to 1854 there were only two years in which its issues numbered as high as 1,000 and its gross income as high as $80,000. Since 1866 its annual issues have not fallen under 12,000. Its total issues number probably 285,000, and 161,000 of these have probably been issued since 1870. It has long been the habit to "point with pride" to this American institution, and to eulogize it as one of the instrumentalities whereby the typical American may very possibly strike a cross-path to independence; that the greater part of all industries, not excepting agriculture, depend upon the economical devices which the patent system has stimulated is true, and the system has wrought almost incalculable benefits; but its mischiefs have been too little thought of.

One of these is the abuse of reissues. The general rule is that the first patentee is entitled to a broad construction of his claim, and the general experience is that he claims the utmost he can, and very frequently more than is allowed him; if, for example, he has invented something which, for the purpose in view, should by made of a particular material and in a particular shape, he is apt to claim other materials and shapes as well, being desirous of putting in all he can think of, so that he may cover the most possible of the applications and modifications which may subsequently come up. This is quite proper, for the patentee is entitled to claim every thing new which he can evolve from his mind, but this right should obviously exclude him from taking the benefit of afterthoughts. But wherever a patentee had claimed too much, and had thus voided his claim by making it a combination of several devices, some one or more of which he could not hold, or wherever his patent was "inoperative or invalid by reason of a defective or insufficient specification," the law provided a remedy by allowing a surrender of the original patent and a reissue, in case the fault was one of innocent mistake. The reissues now number over 10,000, and it is probably safe to say that a large portion of them have been deliberately planned and complacently and too good-naturedly allowed by a lax administration of the law, to cover and take in improvements devised subsequently to the original issues and in the line of what was not then known.—*Exchange*

A Narrow Escape.

[Austin (Tex.) Siftings.]

A young Austin doctor, who has just graduated, was asked the following question by an old practitioner:

"Suppose you were called in to see a wealthy patient, and there was nothing the matter with him, what would you do?"

"I would suggest that he set up the wine to celebrate his narrow escape from having me treat him professionally."

"Young man, you have a heap to learn," was the reply of the old doctor.

A Liberal Southern Town.

The General Manager of the Western Union Telegraph Company has proposed to the citizens of Lexington, Ga., that if they would furnish and put up the posts to Crawford the company would furnish the wire and instruments, and give Lexington telegraph communication with the rest of the world. The citizens hastily accepted the proposition, and in one day enough funds were raised to accomplish the purpose.—*Chattanooga Tradesman.*

Egypt's Debt.

The debt which Egypt owes to Europe—chiefly to England and France—nominally amounts to $500,000,000, a very large sum for such a country. On September 1 last it was quoted at almost its full face value, but two weeks ago it had dwindled down to about $375,000,000. Egypt, it must be remembered, has surrendered her right to repudiate this debt, she having given a first mortgage for it on her treasury, which mortgage the Powers have a right to foreclose at any time.

The value placed upon a property is regulated by its earning capacity. Especially should this be the case when it has, virtually, exclusive privileges—an almost sole possession of territory on which others cannot encroach without serious loss. The earning capacity of the Western Union Telegraph Company, compared with its capital, is greater than that of any other organization in this country whose stock is offered at all freely to the public, as will be seen by statistics herewith inserted. The Company is earning now six millions of dollars a year, even allowing for a very considerable diminution in the rates for transmitting messages, and after making most liberal provisions for renewals and extensions. If six millions of dollars a year profit can be earned, it justifies a capitalization of eighty millions, because this amount is equal to over seven per cent. per annum, and it only requires $4,800,000 to make a dividend of six per cent. on the existing capital. While, therefore, the capital seems large, representing, as it does, property of a fragile and perishable character, the foregoing considerations should not be lost sight of. To this should be added the most important fact—that the good will, existence, and organization of a business so vast and comprehensive are of immense value, as it would take many years to create a traffic of equal volume.

At the Physical Society on June 17th, Mr. Bosanquet described the results he had obtained in the substitution of home-made Fauré accumulators charged by a magneto-electric machine for Grove or voltaic batteries in working electro-magnetic apparatus. He finds that an accumulator of twenty cells charged for two hours by a Gramme machine will keep his apparatus running for a week, and thus save him the trouble of re-charging a battery of thirty Grove cells every day. In this connection Professor John Perry took occasion to remark that well-made Fauré accumulators, such as those made by the Fauré Company, and having a layer of minium of uniform thickness, do not lose their charge, as is frequently stated in print, nor is there that local action which is so evident in accumulators made by putting the minium in holes cast in the plates themselves.

New Books.

"On the Borderland." A novel, by Miss Harriette A. Keyser; published by G. P. Putnam & Sons, New York. This is a very interesting story, so well and skilfully written that the reader is interested to the very close of the last chapter. The sketches of character are remarkably natural and ingenious.

NEW PATENTS—ELECTRICAL—1882.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 27TH, 1882.

260,110. Armature for Dynamo-Electric Machines. James J. McTighe and Thomas J. McTighe, Pittsburg, Pa. Filed Mar. 28, 1882. (No model.)

260,206. Apparatus for suspending Electric Lamps. Charles C. Jennings, Buffalo, N. Y. Filed May 11, 1882. (No model.)

260,111. Commutator for Dynamo-Electric Machines. James J. McTighe and Thomas J. McTighe, Pittsburg, Pa. Filed May 3, 1882. (No model.)

260,132. Dynamo-Electric Machine. Elmer A. Sperry, Cortland, N. Y. Filed Dec. 22, 1880. (No model.)

260,208. Duplex Telegraph, Francis W. Jones, New York, N. Y., assignor to the Union Electric Manufacturing Company, same place. Filed Nov. 11, 1881. (No model.)

260,273. Device for Insulating and Protecting Telegraph Wires and other Electrical Conductors. William E. Banta, Springfield, Ohio, assignor of two-fifths to John M. Dodd and Abner M. Crothers, both of same place. Filed Nov. 8, 1881. (No model.)

260,029. Electric Light. Philip O. Jenkins, Washington, D. C. Filed Sept. 28, 1881. (No model.)

260,067. Electrical Switch-Board. Theodore N. Vail, Boston, Mass. Filed April 28, 1882. (No model.)

260,204. Electric-Arc Lamp. Charles A. Hussey, New York, N. Y., assignor to the Hussey Electric Company, same place. Filed Aug. 31, 1881. (No model.)

260,288. Electric Lamp. James Du Shane, South Bend, Ind. Filed Oct. 25, 1881. (No model.)

260,335. Incandescent Electric Lamp. Joseph W. Swan, Newcastle-upon-Tyne, England. Filed Apr. 17, 1882. (No model.) Patented in England Sept. 29, 1881, No. 4,202.

260,201. Lamp-Fixture. John A. Hull, Ansonia, Conn., assignor to Wolcott A. Hull, New York, N. Y., and the Assonia Brass and Copper Company, Ansonia, Conn. Filed April 10, 1882. (No model.)

260,136. Regulator for Dynamo-Electric Machines. René Thury, Geneva, Switzerland. Filed July 5, 1881. (No model.)

260,306. Telegraphic Receiving-Instrument. William H. Markland, Brooklyn, assignor to James E. Chandler and Albert G. Wheeler, New York, N. Y. Filed Feb. 24, 1882. (No model.)

260,180. Telephone Signaling and Receiving Apparatus. Charles Ewing, Washington, D. D. Filed Mar. 23, 1882. (No model.)

FOR THE WEEK ENDING JULY 4TH, 1882.

260,650. Current-Governor for Dynamo-Electric Machines. Charles F. Brush, Cleveland, Ohio. Filed June 29, 1880. (No model.)

260,480. Dynamo-Electric Machine. Charles Heisler, St. Louis, Mo. Filed July 12, 1880. (No model.)

260,541. Dynamo-Electric Machine. Joseph A. I. Craig, Montreal, Quebec, Canada, assignor of two-thirds to Edwin Ruthven Whitney and Charles Lucien Bosse, both of same place. Filed Oct. 26, 1881. (No model.)

260,652. Dynamo-Electric Machine. Charles F. Brush, Cleveland, Ohio. Filed June 1, 1880. (No model.)

260,574. Electromotor. John H. Irwin, Martin, Pa. Filed Mar. 6, 1882. (No model.)

260,408. Electric Pumping Apparatus. Charles C. Peck and William H. Chapman, Middlebury, Vt. Filed Aug. 29, 1881. (No model.)

260,536. Electric Burglar-Alarm. Charles E. Chinnock, Brooklyn, N. Y. Filed April 8, 1882. (No model.)

260,600. Electric Incandescent Lamp. Hans J. Müller, New York, N. Y., assignor to himself and Alexander Levett, same place. Filed Apr. 11, 1882. (No model.)

260,264. Electric Lighting Eli T. Starr, Philadelphia, Pa., and William J. Peyton, Washington, D. C. Filed May 10, 1882. (No model.)

260,646. Electric Condenser. Spencer Borden, Fall River, Mass, assignor of one-half to William C. Wood, Washington, D. C. Filed June 9, 1881. (No model.)

260,647. Electric Arc Lamp. Spencer Burden, Fall River, Mass., assignor to William C. Wood, Washington, D. C. Filed Sept. 27, 1881. (No model.)

260,623. Means for Controlling Electric Motors. Eli T. Starr, Philadelphia, Pa., assignor of one-half to William J. Peyton, Washington. Filed Apr. 11, 1882. (No model.)

260 575. Regulator for Dynamo-Electric Machines. John H. Irwin, Morton, Pa. Filed Apr. 24, 1882. (No model.)

260,653. Secondary Battery. Charles F. Brush, Cleveland, Ohio. Filed June 15, 1882. (No model.)

260,654. Secondary Battery Charles F. Brush, Cleveland, Ohio. Filed June 15, 1882. (No model.)

260,488. Telephone-Transmitter. Henry B. Lytle, Boston, Mass. Filed Feb. 1, 1882. (No model.)

260,667. Telephone-Exchange Switch Apparatus. George W. Coy, Milford, Conn., assignor of two-thirds to James G. Smith, Hackensack, N. J., and Charles E. Buell, Washington, D. C. Filed Feb. 23, 1882 (No model.)

260,449. Telegraph-Key. Thomas Burn, Chicago, Ill. Filed Mar. 25, 1882. (No model.)

260,651. Thermic Regulator for Electric Current Generators. Charles F. Brush, Cleveland, Ohio. Filed July 16, 1880. (Model.)

260,548. Underground Conduit for Electric Wire. Josiah S. Du Bois, Haddonfield, N. J. Filed Feb. 27, 1882. (No model.)

FOR THE WEEK ENDING JULY 11, 1882.

260,806. Automatic Electric Gas-Lighting Apparatus. Jacob P. Tirrell, Boston, Mass., assignor to the Electric Gas Lighting Company, Portland, Me. Filed Dec. 27, 1881.

260,866. Dynamo-Electric Machine. Charles D. Haskins and Charles M. Lungren, New York, N. Y. Filed Apr. 17, 1882. (No model.)

260,751. Electric Clock. Carl Gullberg, Jersey City, N. J. Filed Aug. 22, 1881. (No model.)

260,804. Electric Gas-Lighting Apparatus. Jacob P. Tirrel, Boston, Mass., assignor to the Electric Gas Lighting Company, Portland, Me. Filed Jan. 16, 1882. (No model.)

260,805. Electric Gas-Lighting Apparatus. Jacob P. Tirrell, Boston, Mass., assignor to the Electric Gas-Lighting Company, Portland, Me. Filed Jan. 16, 1882. (No model.)

260,884. Electrical Signaling Apparatus for Telephone-Lines. Thomas D. Lockwood, Malden, Mass. Filed Jan. 6, 1882. (No model.)

260,925. Electric-Arc Lamp. Charles E. Ball, Philadelphia, Pa. Filed May 3, 1882. (No model.)

260,975. Electric-Arc Lamp. John H. Guest, Brooklyn, N. Y. Filed May 23, 1882. (No model).

260,982. Electric Call. George W. Howser, Chicago, Ill. Filed Apr. 17, 1882. (No model.)

261,043. Electric Gas-Lighter. Thomas H. Rhodes, Brooklyn, N. Y., assignor to himself and the Smith & Rhodes Electric Company, (Limited,) New York, N. Y. Filed June 5, 1882. (No model.)

261,067. Electric-Arc Lamp. Elihu Thomson, New Britain, Conn., assignor to the American Electric Company, same place. Filed July 9, 1881. (No model.)

261,077. Electric-Circuit System. Charles F. Brush, Cleveland, Ohio. Filed June 4, 1880. (No model.)

261,091. Electric-Arc Lamp. Charles D. Haskins, New York, N. Y., assignor to the Union Electric Manufacturing Company, same place. Filed Jan. 25, 1882. (No model.)

260,859. Galvanic Battery. Charles Friedel, Madison, Wis. Filed Mar. 25, 1882. (No model.)

260,883. Telephone System. Thomas D. Lockwood, Malden, Mass. Filed Jan. 27, 1882. (No model.)

260,939. Telephone System and Apparatus. Chas. E. Chinnock, Brooklyn, N. Y. Filed Apr. 8, 1882. (No model.)

260,037. Switch for Electric Light System. Willard L. Candee, Brooklyn, N. Y. Filed May 3, 1882. (No model.)

261,118 Statical Electrical Apparatus. Edmund B. Benjamin, New York, N. Y. Filed Mar. 24, 1882. (No model.)

A printed copy of the specification and drawing of any patent published herein, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering, please state the number and date of the patent desired.

The Index of the *U. S. Patent Office Official Gazette*, vol. 20, July to December, 1881, just published, is a quarto of 304 pages, representing 1,894 pages more of subject matter, which contains 8,005 regular patents, numbering from 243,680 to 251,684; besides 210 reissues, 310 designs, 552 trade marks, and 96 labels. As usual, electricity occupies the foremost rank, with its 72 sub-classes, and presents a total of 394 patents for the half year, 48 of which are credited to Professor T. A. Edison. The different forms of arc, and incandescent lights, with dynamos, lamps, carbons, meters, &c., give a list of 96 patents; telephony coming next with 88, and telegraphy third, with 54; the remaining 56 patents being mostly various electrical devices for insulation batteries, switch-board cables, underground conduits, signals, alarms, annunciators, clocks, magnets, circuits, motors, gas-lighting, &c.

John Arnold wrote on an order of the Supreme Court at Indianapolis, "The Court may go to the devil," and sent the document back to the Judge. For this he was sent to jail for ten days.

This country has 1 medical man to every 600 inhabitants, while Canada has only 1 to 1,200 inhabitants, Great Britian 1 to 1,672, and Germany 1 to 3,000.

A recalcitrant subscriber told a country editor to stop his paper, and the provincial paste-dabbler replied: "A mule's right to kick has never yet been disputed. Your wish is complied with."

In Montana, on a day fixed for a wedding, the bridegroom did not come to time. He was sued for breach of promise, and showed that all the hours of the day specified he was treed by a bear. Some men couldn't be unlucky if they wanted to.

Down at Asbury Park they are congregating like bees just before sundown, and in the language of the ancient Romans, "the place is alive with citizens." There are some sixty hotels there, and people step up cheerfully to the captain's office pay their money and take their choice. Our choice has frequently been between a cot in the top hall or the bowling alley.

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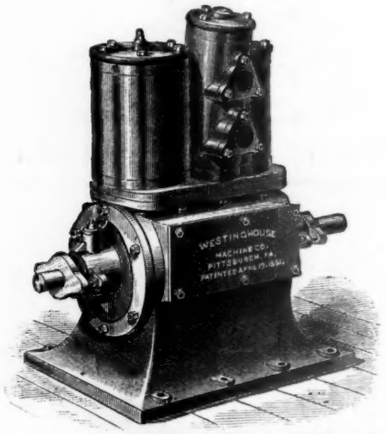

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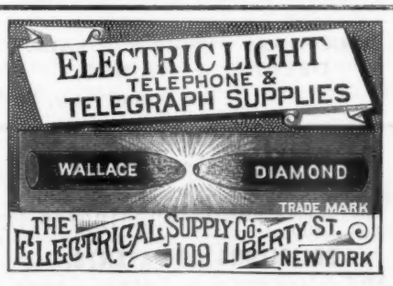

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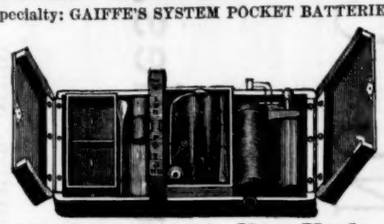

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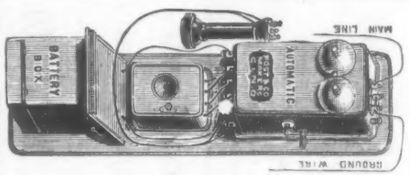

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